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Victor L. Talroze: 1922–2004

Victor Talroze was born in the town of Tula, Russia on April 15 1922. He always had fond memories of Tula and he liked to recount how it was famous for bicycle racing. At the age of seventeen he left Tula to enter the Department of Chemistry, Moscow State University, but he studied there only two years before volunteering for Army service in the war against Germany. He was wounded and hospitalized three times but remained in the army until the completion of hostilities in 1945, when he returned to his studies. A year later he started graduate research in the laboratory of Academician Viktor Kondrat'ev, the pupil of Nikolai Semenov, Director of the Institute of Chemical Physics, completing his diploma work in 1947. He was then ordered to participate in field tests of the Russian atomic bomb, returning to his research work in 1949. During this period he was a Junior Scientist in the Institute of Chemical Physics but then was rapidly promoted to Senior Scientist, Group Leader, and by age 36, Laboratory Head. This was an exciting time and place for a young scientist as Semenov was awarded the 1956 Nobel Prize in Chemistry, jointly with Cyril Hinshelwood, for their work on free radical reactions.

By this time Victor had already carried out the research study for which he became best known, namely the identification and characterization of the methonium ion, CH_5^+, which was published in 1952. The non-classical nature of this species caused extensive controversy, indeed the finding was judged impossible because it contradicted valency rules. This judgment came despite the fact that at approximately the same time, what is now called hypervalency was observed in the bulk phase in diboranes and bridged norbornyl cations. Later, the chemistry of hypervalent compounds became a very hot research field. But despite the controversy, Victor's observation was incontrovertible as he and his young student Anna Lyubimova produced definitive proof of the ion's composition by resolving the *m/z* 17 multiplet. This finding subsequently led to the development by Field and Munson of the first widely used "soft ionization" method in mass spectrometry, namely chemical ionization. However, Victor himself was vehemently opposed to the use of the term chemical ionization which he considered to be an incomplete description of a process that first requires an ion/molecule reaction to produce the potential proton donor and then another ion/molecule reaction that transfers the proton to the analyte. His less elegant but more correct description was "ion/molecular reaction ionization". Although chemical ionization became established as a valuable and important analytical method, Victor was more interested in the physical aspects, one of his developments being the "bracketing" method for measuring proton affinities. This was pos-

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sible because of the unexpected absence of any activation energy in the ion/molecule reactions. Victor, with his pupil Eugene Frankevich, demonstrated that exothermic ion/molecule reactions always occur, even when the partners have no relative kinetic energy, whereas endothermic reactions do not occur.

Victor made other pioneering contributions to mass spectrometry, including the mass spectrometry of free radicals. He constructed an instrument capable of ionizing, separating, and focusing free radicals and colliding them with molecules, which allowed the detection of radical and molecular products in different electronically and vibronically excited states. The chemistry of free radicals became one of his major fields of interest, to the degree that he organized and headed a Department of Free Radicals within the Institute of Chemical Physics. Together with his pupil Eugene Nikolaev, he resolved for the first time one of the closest mass spectral doublets, namely tritium and ^{3}He, and measured the mass difference between these elements, which is directly connected to the neutrino rest mass. Later, together with Alexander Dodonov, he invented the orthogonal TOF instrument which is now widely used in biological research. However, his research was much broader than just mass spectrometry, embracing radiation chemistry, atmospheric chemistry, explosives, industrial chemistry, and military science. Indeed, he was awarded the Lenin Prize, the highest prize in the former Soviet Union, not for mass spectrometry but for a series of papers in the field of chemical lasers.

Victor's scientific ability was recognized by the Institute of the Academy of Sciences of the USSR which in 1962 awarded him the degree of Doctor of Science. In addition to being a very talented laboratory researcher, Victor achieved distinction as a scientific leader within the Academy. In 1972 he was appointed Deputy Director of the Institute of Chemical Physics under Semenov, and following Semenov's death in 1986, Victor founded and became the first Director of the Institute of Energy Problems of Chemical Physics. He also sat on numerous important committees. Simultaneously, he had a long association with his Alma Mater, Moscow State University. He was a Professor and Dean of the Department of Molecular and Chemical Physics of Phystech, an elite institution created at Moscow State in 1946 to combine teaching with pre-eminent Soviet research. Over the course of his career he was personally responsible for training some hundreds of research students, many of whom went on to achieve the highest distinction in their own careers.

In his later years Victor resigned from his administrative positions but continued to dedicate himself to research. His career spanned the cold war years and international travel was difficult but Victor had numerous friends and colleagues outside the USSR. In 1963 he was awarded the Bourke Medal of the Faraday Society and he visited the UK to deliver his lecture. Other trips included visits to the United States and Canada. During the 1990s he spent some time working in western European universities, including times spent with Professor John Beynon at University College Swansea in South Wales and with Professor Bo Sundquist in Upsala, Sweden. A year's study leave with Professor Al Burlingame at the University of California, San Francisco, in 1997 led to the final chapter in his personal and professional life. Starting out as a Visiting Professor, Victor eventually became a permanent member of the research faculty and, together with his wife Eugenia, he made a new home in Northern California. He realized that a major emphasis in mass spectrometry had switched to biomolecular analysis in fields such as proteomics. His interest in explosives was transferred to desorption ionization methods, believing that using an explosive matrix to achieve rapid gas release in PDMS or MALDI would aid in the desorption of large biomolecules from the solid state. In practice it was found that even the typical carboxylic acid matrices used in MALDI would release CO_2 gas on laser irradiation and this resulted in the theory of "pneumatic assistance" for MALDI. As a chemical physicist with a strong theoretical background, Victor was firmly convinced that there was no adequate explanation of the energetics of the desorption process in MALDI, whereas gas release could provide such a mechanism. He made this his final crusade, presenting lectures and posters at every ASMS meeting and International Mass Spectrometry Conference in the last years of his life.

Despite being geographically remote from his Moscow roots and the Institute that he had founded, he continued a close connection with his Moscow coworkers and friends. He visited Russia several times each year and continued to organize joint grants with United States and European groups, in which he actively participated. In 2002 he organized an international mass spectrometry workshop-school: Mass Spectrometry in Chemical Physics, Biophysics, and Environmental Science. This was the first Russian conference on mass spectrometry after a hiatus of 17 years. His dream was to establish this as a series of on-going conferences, and in fact the second such event will be held in Zvenigorod this October.

Victor Talroze made enormous contributions to science. His role in the development of mass spectrometry was recognized at the 16th International Mass Spectrometry Conference in Edinburgh in 2003, when he was awarded the Thomson Gold Medal for "outstanding achievements in and distinguished service to international mass spectrometry". He had an influence on everyone who knew him and he will be sadly missed. Right to the end of his life he was deeply committed to science but he was also a true intellectual with a wide interest in current affairs,

politics, and the arts. He was also a tennis aficionado and took great pleasure in the emergence of several Russian players in the top ranks of both men's and women's tennis. He passed away on June 22, 2004, in Novato, California, leaving a daughter, Raisa, two grandchildren, Ilya and Irina, and a great-grandchild, Anna, all of whom live in California.

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